Between a Diploma and a Bachelor's Degree: The Effects of Sub-Baccalaureate Postsecondary Educational Attainment and Field of Training on Earnings

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ABSTRACT

Educational attainment is a well-documented path to economic success. Apart from the recognized benefits of a bachelor's degree, research documents benefits for sub-baccalaureate education such as vocational and associate's degree programs. This study explores the returns to education from the educational attainment levels that fall between a high school and a college degree. Using data from the 2004 and 2001 panels of the Survey of Income and Program Participation (SIPP), we examine the association between educational attainment and earnings, particularly the role of field of training. Adults with sub-baccalaureate degrees earn more on average than high school graduates, but this was not true for all fields such as education and service. These analyses also address the role of occupation related to the field of sub-baccalaureate training. We find that being in a related occupation is generally associated with higher earnings, but with variation by sub-baccalaureate field and level.

INTRODUCTION

Research has consistently documented the positive relation between education and economic benefits (e.g., Day and Newburger 2002). Data collected in 2008 by the Census Bureau show bachelor's degree recipients earned about $26,000 more on average than workers with a high school diploma. Recognizing its economic importance, policy makers, including most recent Presidents, have advocated improving and expanding education in a variety of ways. President Clinton emphasized access to college. President George W. Bush emphasized improvements to elementary and secondary schools. President Obama has recently moved in a slightly new direction by calling for Americans to commit to at least one year of higher education or training beyond high school.

Post-secondary education has increased considerably in recent decades (Crissey 2009*)*. This trend is particularly evident at the sub-baccalaureate level, which has seen a 28 percent increase in the number of degrees awarded between 1997 and 2007 (U.S. Department of Education 2009). During the mid-2000's, the rate of increase in sub-baccalaureate degrees exceeded the rate of increase in bachelor's degrees. The growth and the emphasis on short-term postsecondary programs puts a new focus on long-running debates about the value of training programs, certification programs, proprietary schools and community colleges (Grubb and Lazerson 2004, Adelman 2000, Brint and Karabel 1989).

A central element in the debates on the value of sub-baccalaureate postsecondary schooling is the distinction between human capital benefits and vocational benefits. In short, human capital benefits are those that result from the knowledge gained from

education – especially that which is not targeted to a specific job. Vocational benefits are those that result from access that is provided to specific well-paying occupations by virtue of the credential earned (see Grubb 1993, Kane and Rouse 1995). Although the cause of these differences remains under debate, sub-baccalaureate postsecondary education with vocational credentials has been shown to provide greater economic return than other types of education (Bailey, Kienzl and Marcotte 2004, Kerckhoff and Bell 1998, Grubb 1993).

In his review of the literature on labor market outcomes for sub-baccalaureate degrees, Grubb (1999) notes consistent positive effects of sub-baccalaureate degrees across multiple studies and data sets. However, he also documents the high level of variability in these effects depending on the characteristics of the individual, program of study, and labor market. As with degrees at the bachelor's level, the field of sub-baccalaureate study impacts earnings. This is true at both the vocational and associate's degree level (Ryan 2005). Using data from the Survey of Income and Program Participation during the 1984 – 1990 period, Grubb (1995) found strong differences in job earnings across field of training, as well as by whether the job was related to the field of study. Taken together, sub-baccalaureate degrees have positive economic effects, but there are conditions where these degrees do not pay off (Grubb 1999).

This study builds upon this research to provide updates and improvements to our understanding about what fields of training contribute to economic success at the sub-baccalaureate postsecondary level. First, we address the association between sub-baccalaureate education and earnings, looking specifically at field and level of training. The second part of the analyses address the effect of working in an occupation related to

the field of training, and compared the association between field of training and earnings by employment in a related occupation.

DATA AND METHODS

We use data from the 2001 and 2004 panels of the Survey of Income and Program Participation (SIPP), which provide a large sample of labor market participants with information on education, field of study, earnings and a large number of other demographic and labor-force related variables. The SIPP is an ongoing, nationally representative panel study of the United States. The survey includes a set of core questions at each interview, as well as a series of unique topical modules that collect detailed information on specific topics at each interview. Each panel includes an Education and Training History Topical Module, which asks the respondents about their educational history, including degrees earned and specific field of training. Our analyses use data from the two most recently completed SIPP panels: SIPP 2004 and SIPP 2001. We restricted the sample to adults who reported any earnings in the 4-month reference period for the Wave 2 interview. We also limited analyses to adults with a high school degree, vocational degree or associate's degree as the highest level of educational attainment. The results in an effective combined sample size of 37,513 people (unweighted cases with a positive final weight) for our analyses.

The outcome variable for analyses is average monthly earnings in 2004. Earnings reported in the 2001 Panel were adjusted for inflation to 2004 dollars based on the annual Current Price Index (CPI-U) (Buearu of Labor Statistics 2010). The field of training categories are separated by vocational and associate's degree, with seven categories for

each level. These categories were collapsed from the original categories included in the Education and Training Topical Module Questionnaire. Exploratory analyses examined each field individually, and the collapsed categories were grouped based on similarity of field and similar characteristics in the variables examined. Collapsing the fields yielded larger sample sizes for each field, and resulted in substantive similar findings.

The vocational field question included 19 categories. Of these 19, 4 were kept as individual categories (business/office management, health care, police/protective services, and other). The remaining categories were collapsed into service (e.g. cosmetology, food service), mechanical (e.g. construction trades, metal working), and computer/technical (e.g. computers and information science, drafting). The associate's field question included 14 categories. Of these 14, 3 were kept as individual categories (education, health sciences, and police and protective services). The remaining categories were collapsed into business (business/office management and communications), computer/technical (computer and information systems and engineering/drafting), liberal arts and sciences (e.g. liberal arts/humanities, social sciences/history), and other (other vocational/technical studies and other).

The variable for occupation related to the field of study was constructed from the crosswalk between the Classification of Instructional Programs (CIP) and the Standard Occupational Classification (SOC) developed by the National Crosswalk Service Center (NCSC). The crosswalk was developed in the 1970s along with the development of the Dictionary of Occupational Titles, which involved nearly 75,000 on-site observations by analysts, and consultation with experts in training and employment subject areas. The current classification scheme results from the collapsing of the 13,000 distinct

occupations covered in the Dictionary to approximately 1,100 occupations. The crosswalk to the CIP makes use of the expert opinions on occupational training requirements from the original Dictionary of Occupational titles, adapted to reflect new occupations and occupational changes as they have occurred (see Peterson et al. 2001).

For this research, the detailed the fields of study listed in the crosswalk were grouped to match the fields reported by respondents in the SIPP. Some occupations (e.g., parking lot attendants) did not have a specific field listed in the crosswalk because no specific training is required. Similarly some fields (e.g., pre-law studies) were not associated with specific occupations. For each occupation that had one or more fields listed, any detailed field that fell within one of the reported fields resulted in a match for that occupation with the reported field.

For example, respondents with degrees or diplomas in the health sciences would be considered to be in a related occupation if they worked in any of the following 37 occupations:

> Registered nurses; Nursing, psychiatric, and home health aides; Licensed practical and licensed vocational nurses; Medical assistants and other healthcare support; Emergency medical techs and paramedics; Secretaries and administrative assistants; Diagnostic related technologists and techs; Clinical laboratory technologists and techs; Dental assistants; Dental hygienists; Medical and health services mgrs; Receptionists and information clerks; Respiratory therapists; Health diagnosing and practitioner support; First-line supervisors of office support workers; Physical therapists; Medical records and health information techs; Occupational therapists; Social workers; Misc. health technologists and techs; Therapists, other; Medical, dental, and ophthalmic laboratory techs; Physical therapist assistants and aides; Counselors; Massage therapists; Radiation therapists; Opticians, dispensing; Other healthcare practitioners occupations; Misc. community and social service specialists; Claims adjusters, appraisers, examiners; Speech-language pathologists; Dietitians and nutritionists; Administrative services mgrs; Pharmacists; Engineers, other; Physician assistants; Computer support specialists.

From this list, it seems that the matching criteria erred on the side of being inclusive. An alternative methodology, using occupations that were most commonly associated with particular fields in the SIPP, created a similar but much shorter list (in the case of health sciences, 6 occupations). Analysis using this alternative methodology produced similar results, albeit not quite as strong as those reported here.

To directly account for the SIPP's complex sample design via the SURVEYREG procedure in the SAS software, we consequently use its generalized least square (GLS) regression to estimate the log of monthly earnings, including control variables for sex, age, age-squared, race, Hispanic origin, and part-time employment. We ran separate models by panel, and present the average coefficients from the two models. Similarly, for design-based/descriptive statistic estimation, we estimated the mean earnings and its standard error using the SURVEYMEANS procedure in the SAS software to account for the SIPP's complex sample design.

RESULTS

Descriptive Statistics

Table 1 displays descriptive statistics produced by weighted estimation from the analytical sample, including mean earnings. In this paper, all direct or implied statistical comparisons are inferred (concluded) based on 5% significance level tests and a statistical comparison automatically implies *significantly different* if not explicitly stated one way or another. About two-thirds of the of the cohort of people represented by the analytical sample were high school graduates, while 15 percent had a vocational certificate, and 20 percent had an associate’s degree. As expected, earnings were higher

for people with vocational and associate's degrees compared to those with a high school degree. The average earnings for high school graduates were $2,203, compared to $2,591 for vocational graduates and $2,977 for associate's degree holders. Also consistent with prior research, we find that earnings were higher for men compared to women, Whites compared to other races, non-Hispanics compared to Hispanics, and full-time employees.

Table 1 also shows the sample distribution across field of training. While earnings overall were higher for associate's degree holders, there was more variation when looking across field of training. For example, mean earnings for people with a vocational degree in a mechanical field were about 40 percent higher than earnings for those with an associate's degree in education ($3,047 and $2,124, respectively).

Table 2 presents sample statistics by related occupation. About one-third of sub-baccalaureate degree holders were employed in a field related to his or her field of study. On average, earnings for those in a related occupation were higher than those who were working in an unrelated occupation ($2,968 and $2,729, respectively). Females were more likely than males to work in a related occupation, as were full-time employees compared to part-time employees, and persons of Hispanic origin compared to non-Hispanics. There were no statistically significant differences in related employment by race or panel year, but there were differences across the field of training. For instance, about two-thirds of business degree holders at each level worked in a related occupation, compared to 12 percent of vocational and 22 percent of associate's degree holders in a computer/technical field.

While earnings overall were higher for the related occupation group, employment in a related occupation was not always associated with higher earnings within educational

level and field of training. For example, average monthly earnings for an associate's degree in education were $1,721 when employed in a related occupation compared to $2,416 when employed in an unrelated occupation.

Regression Results

Table 3 displays results from regression models predicting log monthly earnings. Model 1 includes only educational level. As shown in the descriptive tables, vocational and associate's degrees were both associated with higher earnings compared to a high school diploma. Because there are a number of other factors that contribute to earnings apart from education, we include control variables for demographic and employment characteristics in all subsequent models. After adjusting for sex, age, race, Hispanic origin, and part-time employment in Model 2, we still find that sub-baccalaureate degrees were associated with higher earnings than high school completion.

Models 3 and 4 include the field of training for each sub-baccalaureate degree. Controlling for demographic and employment control variables in Model 3, we find that most, but not all, fields of sub-baccalaureate training were associated with higher earnings than a high school diploma. Specifically, we find that earnings from vocational degrees in service and police/protective service fields and associate's degrees in police/protective services and education were not significantly different from high school diplomas. Model 4 includes the field of training, but also adds a variable accounting for employment in an occupation related to the field of training. In this model, we find that only two vocational fields (computer/technical and other) were associated with higher earnings relative to a high school diploma. However, all of the associate's fields except

police/protective services and education were still significantly different from high school.

The final analyses address the differential effect of related unemployment by field of training. Table 4 presents the estimates of the effect of field of training combined with related occupation on log monthly earnings. At the vocational level, some fields were associated with significantly higher earnings regardless of related employment. For instance, people with a vocational degree in a mechanical field earned more than high school graduates whether they were employed in a mechanically-related occupation or not. The same pattern was true for computer/technical and "other" fields of vocational degree. On the other hand, vocational degrees in service were not associated with higher earnings compared to high school diplomas in either of the related occupation categories. For the remaining fields of vocational study (business, health, and police/protective services), earnings were significantly higher than a high school diploma only when employed in a related field.

At the associate's level, the fields of study associated with higher earnings regardless of related occupation were business, computer/technical, and "other". Education degrees were not associated with higher earnings in either relevant occupation category. Health and police/protective services associate's degrees were only associated with higher earnings for those in related occupations. For associate's degrees in liberal arts/sciences, earnings were significantly higher only when employed in an unrelated occupation.

DISCUSSION AND CONCLUSIONS

The results from these analyses reveal a complicated relationship between educational attainment, field of training, employment in a related occupation, and earnings. When considered separately, we find that each of these three characteristics was associated with earnings. However, we also find that these characteristics interact with each other. We first considered the dimension of educational attainment, and found that sub-baccalaureate degrees were associated with higher earnings compared to completing just a high school degree. These findings persisted net of controls for age, sex, race, Hispanic origin, and work status. We then included the field of training, and found that not all fields are linked to higher earnings. Earnings were higher for people who had a sub-baccalaureate degree in business, computer/technical, and health fields compared to high school graduates, while people with degrees in service and education fields did not earn significantly more than high school graduates. Accounting for occupation in a related field explained the effect of several vocational fields of study, but most fields at the associate's level were still positive associated with earnings.

While employment in a related occupation was positively associated with earnings, there were some fields where it did not matter. For instance, the computer/technical field of study was the most consistently lucrative relative to a high school diploma. Whether a person has a vocational or an associate's degree, or whether he or she works in a related occupation, a person with a computer/technical sub-baccalaureate degree on average made more than a high school graduate. This finding is consistent with the theory that education builds general human capital, which translates into higher earnings regardless of employment in a targeted field.

Other fields of study appeared to only pay off if translated into related employment. Sub-baccalaureate degrees in the field of health and police/protective services were only associated with higher earnings relative to high school graduates when employed in a related occupation. This is perhaps more consistent with the vocational theory of education, which stipulates that training provides access to specific occupations that provide higher pay.

Given the increase in the number of sub-baccalaureate awards and the focus on the economic returns to these types of degrees, it is important to note that not all sub-baccalaureate degrees appear to pay off. Vocational service degrees and associate's degrees in education were never associated with higher earnings than a high school degree, even when considering related employment. While there are likely potential benefits to obtaining these types of degrees, we did not find an earnings premium associated with training for service and educational occupations.

This research adds to the long literature on the economic benefits of education. We specifically addressed the role of sub-baccalaureate degrees compared to high school degrees, and find that the economic benefits of vocational and associate's degrees depends in part on the level, field of training, and the ability to find related employment.

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Table 1. Sample Characteristics and Mean Earnings by Educational Attainment, Field of Training, and Control Variables

	Unweighted Sample Size	Weighted Mean Monthly Earnings (2004 Dollars)	S.E. Earnings
Total	**37,513**	**2,416**	**13**
Educational Attainment and Field of Training			
High School Graduate	24,336	2,203	15
Vocational	5,854	2,591	31
Business	704	2,371	67
Computer/Technical	664	3,066	105
Health	914	2,025	67
Police/Protective Services	76	2,933	217
Mechanical	1,256	3,047	72
Service	542	1,862	75
Other	1,698	2,658	59
Associate's	7,323	2,977	35
Business	1,632	2,994	65
Computer/Technical	851	3,737	160
Health	1,090	2,820	58
Police/Protective Services	161	3,480	282
Education	248	2,124	124
Liberal Arts and Sciences	994	2,603	63
Other	2,347	2,980	65
Sex			
Male	19,200	2,857	21
Female	18,313	1,928	14
Race			
White	30,576	2,487	15
Black	4,997	2,020	24
Asian	703	2,206	76
Other	1,237	2,276	61
Hispanic origin			
Yes	3,481	2,020	30
No	34,032	2,468	14
Employment Status			
Part-time	11,697	1,593	21
Full-time	25,816	2,774	15
Panel			
2004	22,578	2,436	18
2001	14,935	2,385	18
Average Age (rounded to whole year)	40	n/a	n/a

Souce: Survey of Income and Program Participation, 2004 and 2001 Panels

Table 2. Sample Characteristics and Mean Earnings, by Related Occupation

	Occupation Related to Field of Study					Occupation Unrelated to Field of Study				
	Un-weighted Sample Size	Weighted Percent	S.E. Percent	Weighted Mean Monthly Earnings (2004 Dollars)	S.E. Earnings	Un-weighted Sample Size	Weighted Percent	S.E. Percent	Weighted Mean Monthly Earnings (2004 Dollars)	S.E. Earnings
Total	**4,458**	**33.4**	**0.4**	**2,968**	**35**	**8,719**	**66.6**	**0.4**	**2,729**	**31**
Educational Attainment and Field of Training										
High School Graduate	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Vocational	2,065	35.0	0.7	2,696	52	3,789	65.0	0.0	2,535	38
Business	446	63.3	2.0	2,581	86	258	36.7	2.0	2,008	104
Computer/Technical	77	11.6	1.4	4,040	285	587	88.4	1.4	2,938	112
Health	391	57.7	1.8	2,237	100	523	42.3	1.8	1,737	76
Police/Protective Services	37	50.5	6.2	3,646	293	39	49.5	6.2	2,208	251
Mechanical	741	58.0	1.5	3,027	71	515	42.0	1.5	3,075	141
Service	175	33.3	2.2	1,738	141	367	66.7	2.2	1,924	87
Other	66	3.8	0.5	3,735	790	1,632	96.2	0.5	2,615	52
Associate's	2,393	32.2	0.6	3,197	48	4,930	67.8	0.6	2,873	46
Business	1,075	65.4	1.3	3,224	80	557	34.6	1.3	2,557	108
Computer/Technical	171	22.3	1.6	4,461	175	680	77.7	1.6	3,529	198
Health	812	74.2	1.5	3,005	59	278	25.8	1.5	2,290	139
Police/Protective Services	57	34.0	4.0	3,676	234	104	66.0	4.0	3,379	410
Education	106	42.1	3.4	1,721	130	142	57.9	3.4	2,416	187
Liberal Arts and Sciences	47	4.4	0.7	2,230	246	947	95.6	0.7	2,620	65
Other	125	5.3	0.5	3,563	248	2,222	94.7	0.5	2,947	67
Sex										
Male	1,718	27.1	0.6	3,618	64	4,573	72.9	0.6	3,303	51
Female	2,740	39.5	0.6	2,543	39	4,146	60.5	0.6	2,069	27
Race										
White	3,648	33.6	0.5	3,043	40	7,095	66.4	0.5	2,823	36
Black	575	33.6	1.3	2,431	75	1,113	66.4	1.3	2,243	52
Asian	70	29.1	3.2	3,190	281	167	70.9	3.2	2,473	128
Other	165	31.6	2.2	3,018	169	344	68.4	2.2	2,419	125
Hispanic origin										
Yes	261	27.9	1.6	2,881	133	646	72.1	1.6	2,404	78
No	4,197	34.0	0.5	2,975	37	8,073	66.0	0.5	2,764	33
Employment Status										
Part-time	1,259	30.5	0.8	2,099	59	5,957	69.5	0.8	1,867	45
Full-time	3,199	34.7	0.5	3,288	42	2,762	65.3	0.5	3,113	39
Panel										
2004	3,027	32.8	0.5	2,985	45	6,041	67.2	0.5	2,716	40
2001	1,431	34.7	0.8	2,932	55	2,678	65.3	0.8	2,758	44
Average Age (rounded to whole year)	42	n/a	n/a	n/a	n/a	41	n/a	n/a	n/a	n/a

Souce: Survey of Income and Program Participation, 2004 and 2001 Panels

Table 3. Coefficients from GLS Regression Estimates Predicting Log Monthly Earnings

	Model 1	Model 2	Model 3	Model 4
Educational Level and Field				
High School Graduate	REF	REF	REF	REF
Vocational Degree	0.219 *	0.154 *		
Business			0.144 *	0.027
Computer/Technical			0.198 *	0.176 *
Health			0.164 *	0.054
Police/Protective Services			0.218	0.128
Mechanical			0.166 *	0.059
Service			-0.017	-0.082
Other			0.187 *	0.179 *
Associate's Degree	0.339 *	0.281 *		
Business			0.284 *	0.162 *
Computer/Technical			0.374 *	0.333 *
Health			0.413 *	0.276 *
Police/Protective Services			0.182	0.118
Education			0.064	-0.011
Liberal Arts and Sciences			0.205 *	0.197 *
Other			0.248 *	0.239 *
Related occupation				0.187 *
Control Variables				
Female		0.089 *	0.089 *	0.089 *
Age		-0.001 *	-0.001 *	-0.001 *
Age-squared		-0.334 *	-0.332 *	-0.334 *
Race				
White		REF	REF	REF
Black		-0.169 *	-0.169 *	-0.167 *
Asian		-0.140 *	-0.140 *	-0.138 *
Other		-0.038	-0.040	-0.039
Hispanic		-0.140 *	-0.138 *	-0.135 *
Part-time employment		-0.682 *	-0.681 *	-0.678 *
Average R^2	0.022	0.267	0.269	0.271
Intercept	7.343	5.921	5.927	5.929

* = coefficient is significant at the p < .05 level

Souce: Survey of Income and Program Participation, 2004 and 2001 Panels

Table 4. Coefficients from GLS Regression Estimates Predicting Log Monthly Earnings

Educational Level and Field, by Related Occupation	
High School Graduate	REF
Vocational	
Business - Unrelated Occupation	-0.004
Business - Related Occupation	0.232 *
Computer/Technical - Unrelated Occupation	0.162 *
Computer/Technical - Related Occupation	0.464 *
Health - Unrelated Occupation	-0.033
Health - Related Occupation	0.292 *
Police/Protective Services - Unrelated Occupation	-0.010
Police/Protective Services - Related Occupation	0.451 *
Mechanical - Unrelated Occupation	0.107 *
Mechanical - Related Occupation	0.209 *
Service - Unrelated Occupation	0.044
Service - Related Occupation	-0.119
Other - Unrelated Occupation	0.182 *
Other - Related Occupation	0.364 *
Associate's	
Business - Unrelated Occupation	0.105 *
Business - Related Occupation	0.380 *
Computer/Technical - Unrelated Occupation	0.319 *
Computer/Technical - Related Occupation	0.564 *
Health - Unrelated Occupation	0.084
Health - Related Occupation	0.531 *
Police/Protective Services - Unrelated Occupation	0.066
Police/Protective Services - Related Occupation	0.384 *
Education - Unrelated Occupation	0.157
Education - Related Occupation	-0.039
Liberal Arts and Sciences - Unrelated Occupation	0.224 *
Liberal Arts and Sciences - Related Occupation	-0.226
Other - Unrelated Occupation	0.251 *
Other - Related Occupation	0.226 *
Control Variables	
Female	-0.337 *
Age	0.089 *
Age-squared	-0.001 *
Race	
White	REF
Black	-0.167 *
Asian	-0.138 *
Other	-0.040
Hispanic	-0.136 *
Part-time employment	-0.676 *
Average R^2	0.273
Intercept	5.930

* = coefficient is significant at the p < .05 level

Souce: Survey of Income and Program Participation, 2004 and 2001 Panels